5. (Amended) A nucleic acid according to Claim 1, wherein the nucleic acid is derived from tobacco plants.

6. (Amended) A nucleic acid according to Claim 1, comprising a sequence selected from

(a) the sequence of SEQ ID NO: 5,

(b) sequences encoding a polypeptide which comprises the amino acid sequence of SEQ ID NO: 6,

(c) partial sequences of the sequences defined under (a) or (b) which are at least 14 base pairs in length,

(d) sequences which hybridize with the sequences defined under (a), (b) or (c),

(e) sequences which are complementary to the sequences defined under (a), (b) or (c), and

(f) sequences which, owing to the degeneracy of the genetic code, encode the same amino acid sequence as the sequences defined under (a) to (c).

7. (Amended) A regulatory region which naturally controls, in plant cells, the transcription of a nucleic acid according to Claim 1.

8. (Amended) A DNA construct comprising a nucleic acid according to Claim 1 and a heterologous promoter.

9. (Amended) A vector comprising a nucleic acid according to Claim 1.

10. (Amended) A vector according to Claim 9, wherein the nucleic acid is linked functionally to regulatory sequences which ensure the expression of the nucleic acid in pro- or eukaryotic cells.

11. (Amended) A host cell containing a nucleic acid according to Claim 1.

12. (Amended) A host cell according to Claim 11, wherein the host cell is a prokaryotic cell.

13. (Amended) A host cell according to Claim 11, wherein the host cell is an eukaryotic cell.

14. (Amended) A polypeptide with the bioactivity of a phytoene synthase which is encoded by a nucleic acid of SEQ ID NO: 1 or SEQ ID NO: 3, comprising an amino acid sequence of SEQ ID NO: 2 or SEQ ID NO: 4.

15. (Amended) A polypeptide with the bioactivity of a zeta-carotene desaturase which is encoded by a nucleic acid according to Claim 1.

16. (Amended) An antibody which binds specifically to a polypeptide of Claim 14.

17. (Amended) An antibody which binds specifically to a polypeptide of Claim 15.

18. (Amended) A process for generating a nucleic acid according to Claim 1, comprising the steps of

(a) completely chemically synthesizing the nucleic acid or

(b) chemically synthesizing oligonucleotides, labelling the oligonucleotides, hybridizing the oligonucleotides with DNA of a genomic or cDNA library which

has been generated starting from genomic DNA or mRNA of plant cells, selecting positive clones and isolating the hybridizing DNA from positive clones, or

(c) chemically synthesizing oligonucleotides and amplifying target DNA by means of PCR.

19. (Amended) A process for generating a polypeptide according to Claim 14, comprising

(a1) culturing a host cell comprising a nucleic acid which encodes a polypeptide comprising the amino acid sequence of SEQ ID NO: 6 under conditions which ensure the expression of the nucleic acid, or

(a2) expressing a nucleic acid which encodes a polypeptide comprising the amino acid sequence of SEQ ID NO: 6 in an *in-vitro* system, and

(b) obtaining the polypeptide from the cell, the culture medium or the *in-vitro* system.

20. (Amended) A method of finding a chemical compound which binds to a polypeptide according to Claim 14 or a polypeptide with the bioactivity of a phytoene desaturase, comprising the following steps

(a) contacting a host cell containing a nucleic acid which encodes a polypeptide comprising the amino acid sequence of SEQ ID NO: 6, a polypeptide according to Claim 14 or a polypeptide with the bioactivity of a phytoene desaturase with a chemical compound or a mixture of chemical compounds under conditions which permit the interaction of a chemical compound with the polypeptide, and

(b) determining the chemical compound which binds specifically to the polypeptide.

21. (Amended) A method of finding a compound which modifies the expression of polypeptides according to Claim 14 or a polypeptide with the bioactivity of a phytoene desaturase, comprising the following steps

(a) contacting a host cell containing a nucleic acid which encodes a polypeptide comprising the amino acid sequence of SEQ ID NO: 6 with a chemical compound or a mixture of chemical compounds,

(b) determining the polypeptide concentration, and

(c) determining the compound which specifically influences the expression of the polypeptide.

25. (Amended) An organism selected from transgenic plants, parts of plants, protoplasts, plant tissues and plant propagation materials, wherein the organism comprises an intracellular concentration of a polypeptide according to Claim 16 which is increased or reduced in comparison with the corresponding wild-type cells after introducing a nucleic acid which encodes a polypeptide comprising the amino acid sequence of SEQ ID NO: 6.

26. (Amended) An organism selected from plants, parts of plants, protoplasts, plant tissues or plant propagation materials, wherein the organism comprises a polypeptide according to Claim 14 whose bioactivity or expression pattern is modified in comparison with the corresponding endogenous polypeptides.

27. (Amended) A method of generating plants, parts of plants, protoplasts, plant tissues or plant propagation materials according to Claim 25, comprising the step of modifying a nucleic acid which encodes a polypeptide comprising the amino acid sequence of SEQ ID NO: 6 by endogenous mutagenesis.

Please add the following claims:

--28. A vector comprising a regulatory region according to Claim 7.

29. A vector comprising a DNA construct according to Claim 8.

30. A host cell containing a DNA construct according to Claim 8.

31. A host cell containing a vector according to Claim 9.

32. A process for generating a polypeptide according to Claim 15, comprising

(a1) culturing a host cell comprising a nucleic acid comprising a sequence selected from

(i) the sequence of SEQ ID NO: 5,

(ii) sequences encoding a polypeptide which comprises the amino acid sequence of SEQ ID NO: 6,

(iii) sequences which hybridize with the sequences defined under (i) or (ii),

(iv) sequences which are complementary to the sequences defined under (i) or (ii), and

(v) sequences which, owing to the degeneracy of the genetic code, encode the same amino acid sequence as the sequences defined under (i) or (ii);

in a culture medium under conditions which ensure the expression of the nucleic acid, or

(a2) expressing a nucleic acid which encodes a polypeptide with the bioactivity of a zeta-carotene desaturase, comprising the amino acid sequence of SEQ ID NO: 6 in an *in-vitro* system, and

(b) obtaining the polypeptide from the cell, the culture medium or the *in-vitro* system.

33. A method of finding a chemical compound which binds to a polypeptide according to Claim 15 or a polypeptide with the bioactivity of a phytoene desaturase, comprising the following steps:

(a) contacting a host cell comprising a nucleic acid which encodes a polypeptide with the bioactivity of a zeta-carotene desaturase, comprising the amino acid sequence of SEQ ID NO: 6, a polypeptide according to Claim 15 or a polypeptide with the bioactivity of a phytoene desaturase with a chemical compound or a mixture of chemical compounds under conditions which permit the interaction of a chemical compound with the polypeptide, and

(b) determining the chemical compound which binds specifically to the polypeptide.

34. A method of finding a compound which modifies the expression of polypeptides according to Claim 15 or a polypeptide with the bioactivity of a phytoene desaturase, comprising the following steps:

(a) contacting a host cell containing a nucleic acid which encodes a polypeptide comprising the amino acid sequence of SEQ ID NO: with a chemical compound or a mixture of chemical compounds,

(b) determining the polypeptide concentration, and

(c) determining the compound which specifically influences the expression of the polypeptide.

35. An organism selected from transgenic plants, parts of plants, protoplasts, plant tissues and plant propagation materials, wherein the organism

comprises an intracellular concentration of a polypeptide according to Claim 17 which is increased or reduced in comparison with the corresponding wild-type cells after introducing a nucleic acid which encodes a polypeptide comprising the amino acid sequence of SEQ ID NO: 6.

36. An organism selected from plants, parts of plants, protoplasts, plant tissues or plant propagation materials, wherein the organism comprises a polypeptide according to Claim 15 whose bioactivity or expression pattern is modified in comparison with the corresponding endogenous polypeptides.

37. A method of generating plants, parts of plants, protoplasts, plant tissues or plant propagation materials according to Claim 25, comprising the step of modifying by endogenous mutagenesis a regulatory region which naturally controls, in plant cells, the transcription of a nucleic acid which encodes a polypeptide comprising the amino acid sequence of SEQ ID NO: 6.

38. A nucleic acid comprising a sequence selected from the group consisting of:

(a) the sequences of SEQ ID NOS: 1, 3 and 5,

(b) sequences encoding polypeptides which comprises the amino acid sequences of SEQ ID NOS: 2, 4, and 6, and

(c) sequences which, owing to the degeneracy of the genetic code, encode the same amino acid sequence as the amino acid sequences of SEQ ID NOS: 2, 4, and 6.--